

MOTREC



T-224D



<p>OPERATOR AND MAINTENANCE MANUAL SPARE PARTS LISTS INCLUDED</p>
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SERIAL NUMBER : 1039902 & UP

Printed in Canada

One Year Limited Warranty

Effective April 25, 2005, MOTREC, Inc. (MOTREC) hereby warrants to the Original Retail Purchaser (Owner) that any of its vehicles shall be free from any defect in materials for a period of 90 DAYS while in the possession of such Original Retail Purchaser. This warranty IS NOT TRANSFERABLE to any subsequent Buyer.

The warranty period is extended to one year or one thousand (1,000) hours, which ever first occurs, on the electric motor, differential (parts that bathe in oil) and the electronic speed controller. MOTREC makes no warranty or representation with respect to the internal combustion engine, tires and batteries, since their respective manufacturers cover such parts. Accessories (light, gage, horn, etc), electrical contacts (switch, solenoid, contactor, relay), diodes & fuses, belts & pulleys, filters & spark plugs, lubricants, brake linings & shoes, brake drums & discs, seals, seats, trim and other items subject to wear are not included in this warranty; nor is any item that in MOTREC sole opinion, shows evidence of neglect, misuse, abuse, collision or alteration.

This warranty shall not apply to normal maintenance requirements as described in the User Manual, and to damages during shipment. The latter is the carrier's responsibility. No compensation will be allowed for delays.

To initiate warranty coverage on any MOTREC vehicle, the Dealer must complete and return the "Sales/Installation Report" to MOTREC within 30 days after delivery to the Original Retail Purchaser; or within 90 days after the delivery date to the Dealer, which ever occurs first. Failure to follow these procedures will result in considering the warranty coverage effective as of the shipment date from the factory.

The defective vehicle must be returned, at the Owner's expense, to an authorised MOTREC Dealer within 30 days after failure. The Owner will not be charged for parts and labour required for warranty repairs, which must be performed by an authorised MOTREC Dealer only. The vehicle will be returned at the owner's expense. The Warranty Claim Forms must be completed and returned with the defective part(s) to MOTREC within 30 days after repair was done. No compensation will be allowed for damages caused by vehicle downtime.

It is the responsibility of the owner of the vehicle to make sure that the driver is properly trained and instructed in the safety features and operation of the vehicle, including vehicle stability, as required by OSHA and ANSI-B56. Operators shall read, understand and follow the safety and operating instructions in MOTREC Manual before driving the vehicle. Operators shall not be permitted to drive the vehicle unless a complete and adequate training has been provided. Driving a vehicle constitutes a hazard. The driver is responsible for the control of the vehicle while driving and must always evaluate and care for all peculiar situations that he or she may meet while driving. The driver assumes the inherent hazards related to this activity. The vehicle is designed for off-road use only. MOTREC disclaims any liability for incidental or consequential damages, to include, but not be limited to, personal injury or property damage arising from vehicle misuse, lack of maintenance or any defect in the vehicle.

It is the responsibility of the Owner of the vehicle to make sure that the service technicians are properly trained as required by OSHA and ANSI-B56. Service technicians shall read, understand and follow instructions in the MOTREC manual before servicing the vehicle. Only qualified and authorized personnel shall be permitted to maintain, repair, adjust and inspect the vehicle.

MOTREC prohibits, and disclaims responsibility for, any vehicle modification altering the weight distribution and stability, increasing the speed or affecting the safety of the vehicle. Such modifications can cause serious personal injury or property damage for which MOTREC disclaims any responsibility.

For Owners that are located outside North America, the warranty period starts the date of shipment from the factory, and the defective parts must be returned at the Owner's expense to MOTREC prior to warranty repair.

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INSTRUCTIONS

SAFETY WARNINGS FOR OPERATORS

- FAILURE TO OBEY THE FOLLOWING SAFETY RULES MAIN RESULT IN SEVERE INJURY.
- It is the responsibility of the owner of this vehicle to train operators to ensure that they understand the operating characteristics of this vehicle, including training in vehicle stability, and obey the following safety rules and guidelines. Owner shall comply with OSHA and ASME/ANSI B56.8 & B56.9 regulations for vehicle use, safety rules, operator training and certification. Do not drive this vehicle unless you are a qualified operator.
- Do not drive this vehicle under the influence of drugs or alcohol.
- Do not drive this vehicle on public roads and highways. This vehicle is designed to be driven in buildings.
- The electrical system of this vehicle will make sparks which can ignite inflammable materials. Never use the vehicle in hazardous areas where there are inflammable materials, explosive dust or fumes in the air.
- Have your vehicle inspected regularly by trained personnel, and cease operation if a malfunction occurs.
- Do not open battery compartment to prevent battery explosion, acid splashing, severe damage to eyes or skin.
- Do not open motor compartment. Keep clear from moving, rotating(wheels, sheaves, etc) or lifting parts.
- Never carry more passengers than number allowed for this vehicle. Wait until all occupants are seated and holding on before moving. Always keep all body parts inside vehicle. Keep both hands on steering wheel.
- Do not exceed the vehicle cargo load capacity and gross trailing weight capacity, rated for flat hard even surface. Different operating conditions such as loose terrain or ramps reduce vehicle capacity.
- Avoid loose, unbalanced or top-heavy loads to keep a good stability and prevent overturn. Do not load cargo that can fall off the vehicle. Do not carry cargo that is longer, wider or higher than this vehicle.
- Always depress slowly the accelerator for smooth acceleration. Avoid stunt driving or horseplay.
- Avoid sharp turns, always slow down before turning, to prevent vehicle overturn or trailer jack knife. Vehicle is more sensitive to overturn and jack knife when traveling on inclines or when carrying a heavy load.
- Always drive straight up and down the face of an incline, never across the face, to prevent overturn and trailer jack knife. Drive slower and start applying brakes sooner on inclines to adjust for longer stopping distance.
- Use extra care and drive slowly in reverse, in congested areas or on wet or slippery ground.
- Keep to the right under normal conditions. Maintain a safe distance from all objects.
- Slow down and sound the horn when approaching a corner or other blind intersections.
- Before leaving the vehicle, park on a level ground flat surface, turn off all switches, set the forward/reverse switch to neutral, set the parking brake, remove the key. Do not park the vehicle on an incline.
- Before battery charging, park the vehicle in a well ventilated area set for. Do not operate it when charging. To interrupt a charging cycle, disconnect the AC plug; disconnecting the DC plug or a battery terminal, or operating the vehicle, could damage the charger and produce a spark, battery explosion and acid splashing.
- Use another driver to steer this vehicle while it is towed. Be sure the driver uses brakes when you slow or stop the towing vehicle. Do not exceed 5 MPH or carry any passenger while towing this vehicle.

MAINTENANCE

SAFETY WARNINGS FOR SERVICE TECHNICIANS

FAILURE TO OBEY THE FOLLOWING SAFETY RULES MAIN RESULT IN SEVERE INJURY.

Owner shall comply with OSHA and ASME/ANSI B56.8 & B56.9 regulations for vehicle maintenance.

Only qualified and authorized personnel shall be permitted to maintain, repair, adjust and inspect carriers, vehicles, tractors, and batteries.

Before any maintenance work, park the vehicle on flat level surface, turn off all switches, remove key, lift wheels off the ground and secure with jack stands of adequate capacity. Don't connect charger.

Keep clear from moving parts such as tires, sheaves and motor.

Follow the maintenance instructions applicable to the type of repair, maintenance, or service.

Always wear a face shield and gloves when working around batteries.

Before opening the battery compartment, disconnect the charger, turn off all switches and remove the key. Batteries emit highly explosive gases which greatly increase when charging; do not disturb connections or produce sparks around batteries to avoid a battery explosion and acid splashing. Battery acid causes severe damage to eyes or skin. Flush contaminated area immediately with water.

Use insulated tools to avoid sparks that can cause battery explosion and acid splashing.

Use two counteracting tools, double-wrench technique, when disconnecting or tightening terminals on the battery and the speed controller to avoid cracking the terminal or battery post welds.

Before cleaning or replacing a battery, charger, speed controller, contactor, relay, diode, or any other component in the power circuit, always disconnect the charger, turn off all switches, remove the key, wear a face shield and gloves, identify battery polarity and disconnect battery leads, discharge the capacitor in the controller with a 10 ohms, 25 W resistor for a few seconds across B+ and B-.

After cleaning, the power must not be reapplied until terminal areas are thoroughly dry.

On EE-Rated vehicles make sure that the control box is sealed, the static strap makes good contact with the ground, the motor is sealed by bands, the cable protectors are properly installed.

Keep cables and wires clear from mechanical and rubbing action. Make sure that cable insulation is free from cutting or visible damage. Make sure that EE-Rated cable protectors are properly installed.

Before replacing a fuse or circuit breaker, identify the cause of failure and repair.

Programmable controllers must be programmed using the parameter settings in this service manual, before connecting the motor, to avoid sudden vehicle movement and accident.

Do not try to increase motor speed by changing parameter settings in the speed controller; it can cause accident and severe damage to the motor.

SEPEX speed controls are protected by a diode in the power circuit to filter inductive loads in the event of a sudden power interrupt. Some speed controllers require a diode to filter inductive loads on the KSI input. Removing the diodes will cause the speed control failure.

Before resuming maintenance operations, inspect safety warnings stickers and replace any if damage is found and part of the text can't be read.

DECALS AND LABELS

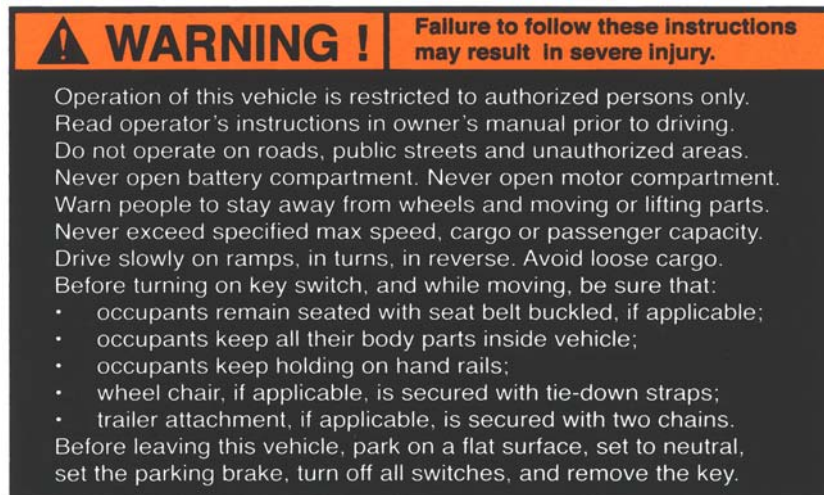
! CAUTION !

The images included in this section depict the decals/markings installed on the vehicle. It is of the utmost importance that these decals/markings remain unaltered and readable. Else, the sticker or the part bearing the marking has to be replaced.

Dashboard security warning label:



General security warning label:



Respectively, key switch markings, forward/reverse selector markings and light switch marking:



PERIODIC MAINTENANCE CHECKLIST

! WARNING !

Maintenance operations must be made by properly trained service technicians.

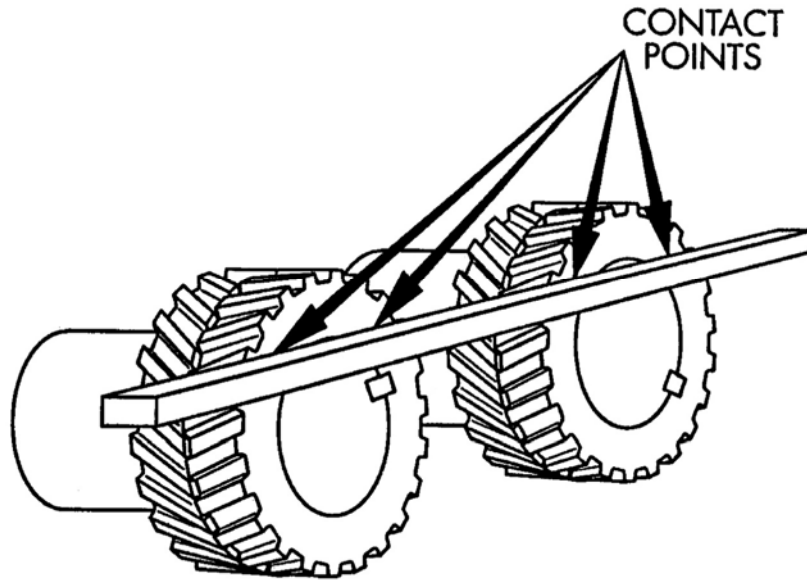
- Keep clear from moving parts such as tires, sheaves and motor.
- Check for all EE protections, when applicable, and keep cables and wires clear from mechanical and rubbing action
- Batteries contain sulphur acid that can cause severe burns on skin or eyes.
- When working around batteries, wear acid proof protective equipment: face shield and gloves.
- Use electrically insulated tools to avoid sparks that can cause battery explosion.
- Before any maintenance work, park the vehicle on a flat level surface, turn off all switches, remove the key, lift the wheels off the ground and secure with jack stands of adequate capacity, identify and disconnect battery leads. Don't connect the charger.

CHECK/PERFORM	PERIOD HOURS	DAY	WEEK 20	MONTH 50	QUART. 200	YEAR 1000	2 YEARS 2000
MECHANICAL DAMAGE, OIL LEAKS		X					
REVERSE ALARM, DEADMAN SWITCH		X					
STATIC STRAP, min 2" contact with ground		X					
TIRE PRESSURE, pressure rating on tire			X				
CHECK/FILL BATTERIES, add distilled water to cover plates. Fill to recommended level after batteries have been fully charged.			X				
WARNING DECALS & MARKINGS				X			
EE-Rated CABLE PROTECTORS, SEALED MOTOR, SEALED CONTROL BOX.				X			
MASTER CYLINDER FLUID (DOT 3)				X			
BRAKE PEDAL TRAVEL 2" (50 mm) maximum travel				X			
STEERING FOR PLAY				X			
PARKING BRAKE LEVER requires 10 lbs. (5 kg) force to apply				X			
BELTS AND PULLEYS -10 lbs (5kg). force for 1/8" (3mm) deflexion; -pulleys alignment, see procedure.					X		
CLEAN/TIGHTEN WIRE TERMINALS					X		
WASH BATTERY TOP WITH WATER					X		
MOTOR BRUSHES FOR WEAR -brushes must exceed holders					X		
ACCELERATOR ADJUSTMENT -1/8" (3 mm) travel to activate micro-switch; -0 to 50 ohms when micro-switch activated; -4500 to 5500 ohms with pedal down.					X		
HYDR. BRAKE LINES FOR LEAK					X		
STEERING ASSEMBLY, as instructed					X		
BRAKE MECHANICAL LINKAGES for wear & play					X		
BRAKE LININGS FOR WEAR 1/16" (1.5 mm) minimum lining thickness.					X		
LUBRICATE brake pedal pivots, steering column, ball joints and kingpins.					X		
OIL (SAE 30) LEVEL IN DIFFERENTIAL Before adding oil, check oil seals for leaks.					X		
FRONT WHEEL BEARINGS PLAY					X		
TIGHTEN NUTS/BOLTS, electric terminals; drive; steering; brakes; suspension; body.					X		
REPLACE DIFFERENTIAL OIL(SAE 30)						X	
CLEAN AND RE-PACK FRONT HUBS						X	
SERVICE DIFFERENTIAL, replace the three oil seals, wheel bearings, oil (SAE 30)							X

BELT INSTALLATION AND TENSIONING

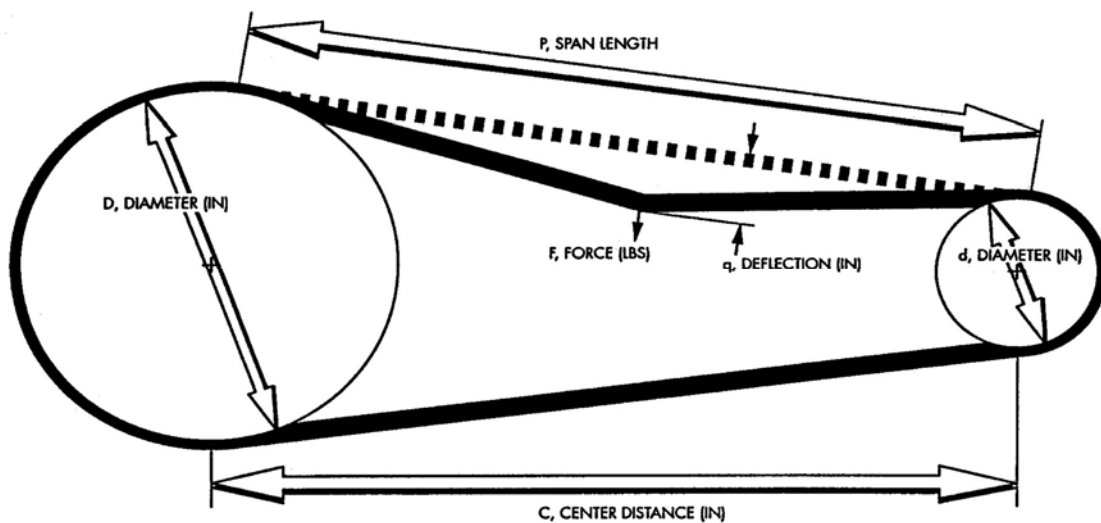
INSTALLATION

Adjust the sprockets using a straight edge. Slide up the edge on the larger pulley until it contacts the smaller pulley. Properly adjusted pulleys will provide three points of contact. Properly aligned pulleys will provide four points of contact. Tighten setscrews and recheck alignment.



TENSIONING

Check the force F required to provide a deflection of $1/8$ in. If the measured force is less than 15 lbs then lengthen centre distance C .



HYDRAULIC BRAKES

DRUM BRAKES

Remove brake drums and check linings wear; the linings should have a thickness exceeding 1/16" (1.5 mm). Turn the brake adjustment to reduce the clearance between lining and drum but avoid contact or drag when the wheels are turned and the pedal is released.

DISC BRAKES

Check pad linings for excessive wear; the linings should have a thickness exceeding 1/16" (1.5 mm). Disc brakes are self-adjusting.

BRAKE PEDAL

If the brake pedal becomes soft or spongy, air may have entered the hydraulic system and the brake system has to be bled:

1. fill the master cylinder with brake fluid (DOT-3);
2. bleed front callipers one at a time by having someone applying a steady pressure on the brake pedal, and close the bleeder before allowing the brake pedal to return to up position;
3. fill the master cylinder with brake fluid (DOT-3);
4. bleed rear wheel brakes one at a time, following the same procedure;
5. fill the master cylinder with brake fluid (DOT-3);
6. clean every fitting and line, remove traces of oil;
7. apply a continuous pressure on the brake pedal for about five minutes ;
8. Finally, inspect brake lines and fittings for leaks ;

BATTERY MAINTENANCE

! WARNING !

- It is the responsibility of the owner of this vehicle to ensure that the service technicians are properly trained, read and obey the safety rules and guidelines in this manual (ANSI B56).
- Maintenance operations must be made by properly trained service technicians only.
- Before any maintenance work, park the vehicle on a flat level surface, turn off all the switches, set to neutral, remove the key, lift the wheels off the ground and secure with jack stands of adequate capacity.
- Keep charger disconnected while doing any maintenance work.
- Always wear a face shield and scarf when working around batteries.
- Battery emits highly explosive gases; do not produce sparks to avoid battery explosion and acid splashing. Battery acid causes severe damage to eyes or skin. Flush contaminated area immediately with water.
- Use insulated tools to avoid sparks that can cause battery explosion and acid splashing.
- Use two counteracting tools, double-wrench technique, when disconnecting or tightening battery posts.
- Before cleaning or replacing a battery, discharge the capacitor in the controller with a 10 ohms, 25 W resistor for a few seconds across B+ and B-, identify battery polarity and disconnect battery leads.
- After cleaning, the power must not be reapplied until terminal areas are thoroughly dry.

BATTERY LEADS AND CONNECTORS

Check for loose connections, damaged cables, acid spill, loose terminal posts, quarterly.

BATTERY POST CORROSION

If corrosion is present on battery posts, remove the cable connectors, use a wire brush to remove particles, and then clean them with a cloth that has been moistened with ammonia.

ELECTROLYTE LEVEL

Does not apply to sealed battery.

- Disconnect battery connectors on roll-out or lift-out installations.
- Make sure the battery roll-out tray is provided with stops before rolling out.
- Fill with distilled water.
- Daily charged batteries normally require watering once a week. Under watering leads to a shortened battery life. Over watering leads to battery corrosion. Be careful not to overfill any cell to avoid electrolyte to be forced out while charging.
- Fill each cell to plate level with distilled or de-ionized water, before battery charging. When the battery is charged, the fluid expands and can seep out if overfilled. Refill each cell after full charge, when the fluid has expanded to its maximum level.
- Reinstall battery caps before charging.

BATTERY MOUNTING

A loose battery increases damaging effects of vibrations and is more prone to short out.

BATTERY DISCHARGE LIMIT

Discharging below a 20% state of charge cuts down the battery life and the number of cycles available. At 20% state of charge, specific gravity of 6V battery should be 1180; and 1220 for industrial battery.

CHARGING AREA

- Always charge battery in a well ventilated area set for and approved for charging.
- Never leave a charger connected for more than 20 hours.

FREQUENCY OF CHARGE

- When a battery is discharged to its 20% state of charge, it is best to charge immediately.
- Batteries require a low current equalization charge (min 4 hours) at least every week, to equalize battery cells, improve battery performance and life in number of cycles.
- Never leave a charger connected for more than 20 hours.

STORAGE

- Keep the battery from getting cold, it would lose its capacity.
- Let the battery warm up before charging.
- Charge batteries in “stored” vehicles every month.

DEFECTIVE BATTERY

Check specific gravity of each cell; if a cell is shorted, voltage drop may occur only when there is current.

ELECTRICAL TROUBLESHOOTING

! WARNING !

Maintenance work must be performed by trained service technicians only.

It is the responsibility of the owner of this vehicle to ensure that the services technicians are properly trained, understand and obey the safety rules and guidelines (ANSI B56).

All service technicians must read and understand the maintenance warning section in this manual.

! WARNING !

Before any maintenance work, park the vehicle on a flat level surface, turn off all switches, remove the key, lift the wheels off the ground, secure with jack stands of adequate capacity, disconnect charger.

Always wear safety glasses.

Batteries emit highly explosive gases that can be ignited by a spark. Before disconnecting a high current terminal, turn off all switches, disconnect battery charger, disconnect batteries.

Keep clear from moving parts such as tires, sheaves and motor.

PMC SELF DIAGNOSTIC

If your PMC comes with a status led, use the flashing code to help troubleshooting.

BATTERY VOLTAGE

Make sure batteries are securely connected. Measure voltage between + and - terminals. We will call this value B+ or full battery voltage.

ACCESSORIES NOT WORKING

- Check the fuses on the batteries and the DC/DC converter.
- Check voltage across + and – terminals on the battery gage; if not B+, check wiring.
- Turn the key switch ON, check voltage between output terminal on the key switch and the - terminal on the battery gage; if not B+, replace the key switch.
- Check voltage across DC/DC converter output terminals; if not 12-Volt, replace the converter.
- Depress the accessory switch, check voltage across accessory terminals. If not 12-Volt, replace the switch. If 12-Volt, replace the accessory.

FORWARD ONLY

On a SEPEX motor control, check the reverse signal input on the controller.

On a series wound motor control, a bad reverse contactor is the most probable cause of the problem.

Switch to reverse and check voltage on the reverse control wire. If not B+, replace the F/R switch. If B+, turn off the key switch, disconnect batteries, disconnect power terminals on the F/R contactors, check the resistance across N.C. power terminals of the reverse contactor. If not 0 ohm, change the reverse contactor. If 0 ohms, switch to forward and check the resistance across the forward N.O. power terminals. If not 0 ohms, change the forward contactor.

REVERSE ONLY

On a SEPEX motor control, check the forward signal input on the controller.

On a series wound motor control, a bad forward contactor is the most probable cause of the problem. Switch to forward and check the voltage on the forward control wire. If not B+, replace the F/R switch. If B+, turn off the key switch, disconnect batteries, disconnect power terminals on the F/R contactors, check the resistance across N.C. power terminals of the forward contactor. If not 0 ohm, change the forward contactor. If 0 ohms, switch to reverse and check the resistance across the reverse N.O. power terminals. If not 0 ohms, change the reverse contactor.

TRAVEL AT REDUCED SPEED

Check batteries.

Turn off all switches and disconnect charger. Wear face shield and gloves. Do not disturb any battery connection to avoid sparks. Check the specific gravity of each cell. Cold batteries, highly discharged batteries or dead cells are the most frequent causes of reduced travel speed.

Check potentiometer.

Turn off the key switch, disconnect potentiometer terminals. Check the resistance between terminals.

Other causes of lower speed:

- dragging brakes;
- cold temperature (higher differential oil viscosity).

INTERMITTENT OPERATION

A bad potentiometer is the most probable cause of the following:

- acceleration is not constant;
- maximum speed is erratic;
- sudden stop after a bump or shock;
- erratic starts, requiring several pedal cycles.

A bad F/R contactor is also a probable cause of the following:

- sudden stop after a bump or shock;
- would not start to move at times.

Erratic starts could also be the cause of a misadjusted potentiometer or micro-switch; the pot signal must be less than 50 ohms when the micro-switch turns on.

PMC has an HPD safety feature that prevents the vehicle from moving if the accelerator pedal is depressed before the key switch is ON and seat switch is activated.

PMC may also have an SRO safety feature that prevents the vehicle from moving if the F/R switch is activated before turning on the key switch and activating the seat switch.

The vehicle stops on a steep and long ramp or while towing a heavy load: the circuit breaker has open to prevent motor overheating and will reset automatically after one minute. The PMC is also equipped with an internal thermal protection that cutback the current until the PMC has cooled down.

NO MOTION

Make sure that the PMC surface is clean and dry; check the terminal areas. Dust Particles or acid contamination, can create current leaks and cause a PMC malfunction.

Check F/R switch

Turn on the key switch and set to forward. Check voltage between the forward terminal and the – terminal on the battery gage, check voltage between the reverse terminal and the – terminal on the battery gage; if both B+, replace the F/R switch.

Check switches and wiring

Disconnect control terminals on the PMC and check all control signals. If a switch pin does not read B+, check wiring or replace the switch.

Check potentiometer

Turn the key switch to OFF, disconnect potentiometer terminals. Check the resistance across terminals: if not within the recommended limits, adjust or replace the potentiometer. Check for shorts between potentiometer wires and vehicle frame; resistance should read at least 1 megohm.

Check main contactor or solenoid

Check voltage across power terminals; if not B+, check circuit breaker or replace the solenoid.

Turn to on the key switch and activate the seat switch. Check voltage across the coil terminals; if not B+, check wiring and interlock switches. Check resistance across power terminals; if not 0 ohms, replace the solenoid.

Check circuit breaker and SEPEX DIODE

Before replacing the circuit breaker, check for shorts in the power circuit and check the SEPEX diode in the power circuit using a diode tester. If no such instrument is at hand, use an ohmmeter: the reading should be weak in one direction and strong in the other way.

Check the resistance across the circuit breaker. If not 0 ohms, replace the circuit breaker.

Check PMC

First disconnect battery B+ and B-, then PMC B+ and M-. Check the internal diode between B+ and M- terminals using a diode tester. If no such instrument is at hand, use an ohmmeter: the reading should be weak in one direction and strong in the other way. If the internal diode is defective, the PMC must be replaced.

Check the Motor

First disconnect battery B+ and B-, disconnect power terminals and check the motor armature and field for opens.

CURTIS SPEED CONTROLLER

MANUAL

CURTISPMC

MODEL **1244**

MultiMode™
MOTOR CONTROLLER

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DESIGN OF CURTIS PMC 1200 SERIES
CONTROLLERS PROTECTED BY U.S.
PATENT NO. 4626750.

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India, Italy, Japan, Netherlands, Puerto
Rico, Russia, Sweden, and Switzerland*

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WIRING: Standard Configuration

Figure 3 shows the typical wiring configuration for most applications. The interlock switch is typically a seat switch, tiller switch, or foot switch.

Standard Power Wiring

Motor armature winding is straightforward, with the armature's A1 connection going to the controller's B+ bus bar and the armature's A2 connection going to the controller's M- bus bar.

The motor's field connections (**F1** and **F2**) to the controller are less obvious. The direction of vehicle travel with the forward direction selected will depend on

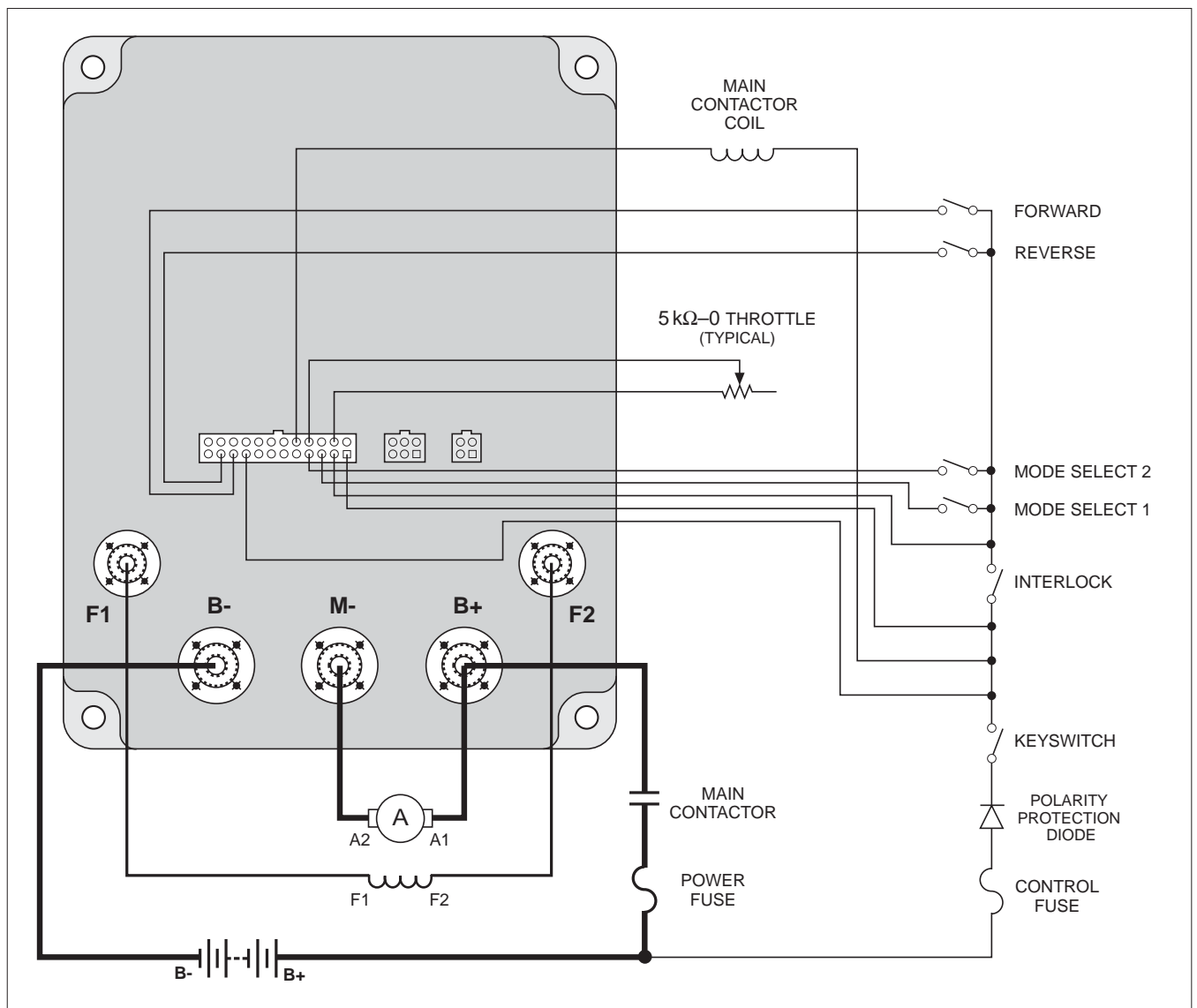


Fig. 3 Standard wiring configuration, Curtis PMC 1244 controller.

8

DIAGNOSTICS AND TROUBLESHOOTING

The 1244 controller provides diagnostics information to assist technicians in troubleshooting drive system problems. The diagnostics information can be obtained by observing the appropriate display on the handheld programmer, the fault codes issued by the Status LED, or the fault display driven by the controller's Fault 1 and Fault 2 outputs. Refer to the troubleshooting chart (Table 5) for suggestions covering a wide range of possible faults.

PROGRAMMER DIAGNOSTICS

The programmer presents complete diagnostic information in plain language. Faults are displayed in the Diagnostic Menu (see column 2 in the troubleshooting chart), and the status of the controller inputs/outputs is displayed in the Test Menu.

Accessing the Diagnostic History Menu provides a list of the faults that have occurred since the diagnostic history file was last cleared. Checking (and clearing) the diagnostic history file is recommended each time the vehicle is brought in for maintenance.

The following 4-step process is recommended for diagnosing and troubleshooting an inoperative vehicle: (1) visually inspect the vehicle for obvious problems; (2) diagnose the problem, using the programmer; (3) test the circuitry with the programmer; and (4) correct the problem. Repeat the last three steps as necessary until the vehicle is operational.

Example: A vehicle that does not operate in “forward” is brought in for repair.

STEP 1: Examine the vehicle and its wiring for any obvious problems, such as broken wires or loose connections.

STEP 2: Connect the programmer, select the Diagnostics Menu, and read the displayed fault information. In this example, the display shows “No Known Faults,” indicating that the controller has not detected anything out of the norm.

STEP 3: Select the Test Menu, and observe the status of the inputs and outputs in the forward direction. In this example, the display shows that the forward switch did not close when “forward” was selected, which means the problem is either in the forward switch or the switch wiring.

STEP 4: Check or replace the forward switch and wiring and repeat the test. If the programmer shows the forward switch closing and the vehicle now drives normally, the problem has been corrected.

Table 5 TROUBLESHOOTING CHART


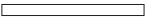
LED CODE	PROGRAMMER LCD DISPLAY	FAULT CATEGORY	EXPLANATION	POSSIBLE CAUSE
1,2	HW FAILSAFE 1 - 2 - 3	1	self-test or watchdog fault	1. Controller defective.
1,3	M- SHORTED	1	internal M- short to B-	1. Controller defective.
	FIELD OPEN	1	field winding fault	1. Motor field wiring loose. 2. Motor field winding open.
	ARM SENSOR	1	armature current sensor fault	1. Controller defective.
	FLD SENSOR	1	field current sensor fault	1. Controller defective.
2,1	THROTTLE FAULT 1	1	wiper signal out of range	1. Throttle input wire open. 2. Throttle input wire shorted to B+ or B-.
	THROTTLE FAULT 2	1	pot low fault	1. Throttle pot defective. 2. Wrong throttle type selected.
2,2	SRO	3	SRO fault	1. Improper sequence of KSI, interlock, and direction inputs. 2. Wrong SRO type selected. 3. Interlock or direction switch circuit open. 4. Sequencing delay too short.
2,3	HPD	3	HPD fault	1. Improper seq. of direction and throttle inputs. 2. Wrong HPD type selected. 3. Misadjusted throttle pot. 4. Sequencing delay too short.
2,4	BB WIRING CHECK	1	emergency reverse wiring fault	1. Emergency reverse wire open. 2. Emergency reverse check wire open.
3,1	CONT DRVR OC	1	cont. driver output overcurrent	1. Contactor coil shorted.
3,2	MAIN CONT WELDED	1	welded main contactor	1. Main contactor stuck closed. 2. Main contactor driver shorted.
3,3	PRECHARGE FAULT	1	internal voltage too low at startup	1. Controller defective. 2. External short, or leakage path to B- on external B+ connection.
3,4	MISSING CONTACTOR	1	missing contactor	1. Any contactor coil open or not connected.
	MAIN CONT DNC	1	main contactor did not close	1. Main contactor missing or wire to coil open.
4,1	LOW BATTERY VOLTAGE	2	low battery voltage	1. Battery voltage <undervoltage cutback limit. 2. Corroded battery terminal. 3. Loose battery or controller terminal.
4,2	OVERVOLTAGE	2	overvoltage	1. Battery voltage >overvoltage shutdown limit. 2. Vehicle operating with charger attached. 3. Battery disconnected during regen braking.
4,3	THERMAL CUTBACK	2	over-/under-temp. cutback	1. Temperature >85°C or < -25°C. 2. Excessive load on vehicle. 3. Improper mounting of controller. 4. Operation in extreme environments.
4,4	ANTI - TIEDOWN	3	Mode 2 or Mode 4 selected at startup	1. Mode switches shorted to B+. 2. Mode switches "tied down" to select Mode 2 or Mode 4 permanently.

LED DIAGNOSTICS

A Status LED is built into the 1244 controller. It is visible through a window in the label on top of the controller. This Status LED displays fault codes when there is a problem with the controller or with the inputs to the controller. During normal operation, with no faults present, the Status LED flashes steadily on and off. If the controller detects a fault, a 2-digit fault identification code is flashed continuously until the fault is corrected. For example, code “3,2”—welded main contactor—appears as:

□ □ □ □ □ □	□ □ □ □ □ □	□ □ □ □ □ □
(3 , 2)	(3 , 2)	(3 , 2)

The codes are listed in Table 6.

Table 6 STATUS LED FAULT CODES		
LED CODES		EXPLANATION
<i>LED off</i>		no power or defective controller
<i>solid on</i>		controller or microprocessor fault
0,1	■ □	controller operational; no faults
1,1	□ □	[not used]
1,2	□ □ □	hardware failsafe fault
1,3	□ □ □ □	M-, current sensor, or motor fault
1,4	□ □ □ □ □	[not used]
2,1	□ □ □	throttle fault
2,2	□ □ □ □	static return to off (SRO) fault
2,3	□ □ □ □ □	high pedal disable (HPD) fault
2,4	□ □ □ □ □ □	emergency reverse circuit check fault
3,1	□ □ □ □ □	contactor driver overcurrent
3,2	□ □ □ □ □ □	welded main contactor
3,3	□ □ □ □ □ □ □	precharge fault
3,4	□ □ □ □ □ □ □ □	missing contactor, or main cont. did not close
4,1	□ □ □ □ □ □	low battery voltage
4,2	□ □ □ □ □ □ □	overvoltage
4,3	□ □ □ □ □ □ □ □	thermal cutback, due to over/under temp.
4,4	□ □ □ □ □ □ □ □ □	anti-tiedown fault

NOTE: Only one fault is indicated at a time, and faults are not queued up. Refer to the troubleshooting chart (Table 5) for suggestions about possible causes of the various faults.

PROGRAMMING PARAMETERS –T-224/224D**! WARNING !**

The owner of this vehicle shall ensure that the service technicians are qualified, properly trained and obey the safety rules and guidelines in OSHA and ANSI B56 regulations, and in this manual.

Before installing and/or programming the PMC, park the vehicle on a flat level surface, lift the wheels off the ground and secure with jack stands of adequate capacity. Don't connect charger.

Programmable controllers must be programmed using the parameter settings in this service manual, before connecting the motor, to avoid sudden vehicle movement and accident.

Do not try to increase motor speed by changing parameter settings in the speed controller; it can cause accident and severe damage to the motor.

VOLTAGE	NOMINAL BATTERY VOLTAGE, IN VOLTS	2	THRO. DEADBAND	Thr. Neutral deadband % of 5kohms pot	6
M1 DRIVE C/L	MODE 1 DRIVE CURRENT LIMIT, IN AMPS	300	THROTTLE MAX	Thr. Input req'd for 100%PWM %5kohm pot	90
M2 DRIVE C/L	MODE 2 DRIVE CURRENT LIMIT, IN AMPS	300	M1 THRTL MAP	MODE 1 THROTTLE MAP, AS %	30
M3 DRIVE C/L	MODE 3 DRIVE CURRENT LIMIT, IN AMPS	300	M2 THRTL MAP	MODE 2 THROTTLE MAP, AS %	30
M4 DRIVE C/L	MODE 4 DRIVE CURRENT LIMIT, IN AMPS	300	M3 THRTL MAP	MODE 3 THROTTLE MAP, AS %	30
M1 BRAKE C/L	MODE 1 BRAKING CURRENT LIMIT, IN AMPS	150	M4 THRTL MAP	MODE 4 THROTTLE MAP, AS %	30
M2 BRAKE C/L	MODE 2 BRAKING CURRENT LIMIT, IN AMPS	150	FIELD MIN	MIN. FIELD CURRENT, IN AMPS	7.5
M3 BRAKE C/L	MODE 3 BRAKING CURRENT LIMIT, IN AMPS	150	FIELD MAX	MAX. FIELD CURRENT, IN AMPS	30
M4 BRAKE C/L	MODE 4 BRAKING CURRENT LIMIT, IN AMPS	150	FIELD MAP START	Armature current at wch FIELD MAP takes effect, amps	150
M1 THRT BRK %	MODE 1 THROT. BRAKING, AS % OF BRAKE C/L	50	FIELD MAP	Field Winding Current, as % of Armature Current	50
M2 THRT BRK %	MODE 2 THROT. BRAKING, AS % OF BRAKE C/L	50	CURRENT RATIO	CURRENT RATIO:FACTOR OF 1, 2, 4 OR 8	1
M3 THRT BRK %	MODE 3 THROT. BRAKING, AS % OF BRAKE C/L	50	RESTRAINT	RAMP RESTRAINT: 1 TO 10	3
M4 THRT BRK %	MODE 4 THROT. BRAKING, AS % OF BRAKE C/L	50	LOAD COMP	LOAD COMPENSATION: 0 TO 25	0
M1 ACCEL RATE	MODE 1 ACCELERATION RATE, IN SEC.	4	HPD	HIGH PEDAL DISABLE (HPD) TYPE	1
M2 ACCEL RATE	MODE 2 ACCELERATION RATE, IN SEC.	4	SRO	STATIC RETURN TO OFF (SRO) TYPE	1
M3 ACCEL RATE	MODE 3 ACCELERATION RATE, IN SEC.	4	SEQUENCING DLY	SEQUENCING DELAY, IN SEC.	1
M4 ACCEL RATE	MODE 4 ACCELERATION RATE, IN SEC.	4	MAIN CONT INTR	MAIN CONTACTOR INTERLOCK: ON OR OFF	ON
DECEL RATE	DECELERATION RATE, IN SEC.	2.5	MAIN OPEN DELAY	MAIN CONTACTOR DROPOUT DELAY, IN SEC.	1
M1 BRAKE RATE	MODE 1 BRAKING RATE, IN SEC.	3	WELD CHECK	MAIN CONTACTOR WELD CHECK: ON OR OFF	ON
M2 BRAKE RATE	MODE 2 BRAKING RATE, IN SEC.	3	MAIN CHECK	MAIN COIL OPEN CHECK: ON OR OFF	ON
M3 BRAKE RATE	MODE 3 BRAKING RATE, IN SEC.	3	AUX ENABLE	AUXILIARY ENABLE: ON OR OFF	OFF
M4 BRAKE RATE	MODE 4 BRAKING RATE, IN SEC.	3	EM BRAKE	ELECTROMAGNETIC BRAKE ON OR OFF	OFF
QUICK START	QUICK START THROTTLE FACTOR	4	AUX DELAY	AUXILIARY DRIVER DROPOUT DELAY, IN SEC.	0
TAPER RATE	Regen brak. Decrease rate when apporch. 0spd, 1/32s	32	AUX CHECK	AUXILIARY COIL OPEN CHECK: ON OR OFF	OFF
M1 MAX SPEED	MODE 1 MAX. SPEED, AS % PWM OUTPUT	40	EM BRAKE DELAY	ELECTROMAGNETIC BRAKE DELAY, IN SEC.	0
M2 MAX SPEED	MODE 2 MAX. SPEED, AS % PWM OUTPUT	100	EM BRAKE CHECK	ELECTROMAG. BRAKE OPEN CHECK: ON OR OFF	OFF
M3 MAX SPEED	MODE 3 MAX. SPEED, AS % PWM OUTPUT	40	REV DRVR CHECK	REVERSE SIGNAL OPEN CHECK: ON OR OFF	OFF
M4 MAX SPEED	MODE 4 MAX. SPEED, AS % PWM OUTPUT	40	CONT PULL IN	CONTACTOR COIL PULL-IN VOLTAGE, AS %	100
M1 CREEP SPEED	MODE 1 CREEP SPEED, AS % PWM OUTPUT	0	CONT HOLDING	CONTACTOR HOLDING VOLTAGE, AS %	100
M2 CREEP SPEED	MODE 2 CREEP SPEED, AS % PWM OUTPUT	0	EMR REV ENABLE	EMERGENCY REVERSE FUNCTION : ON OR OFF	OFF
M3 CREEP SPEED	MODE 3 CREEP SPEED, AS % PWM OUTPUT	0	EMR REV C/L	EMERGENCY REVERSE CURRENT LIMIT, IN AMPS	50
M4 CREEP SPEED	MODE 4 CREEP SPEED, AS % PWM OUTPUT	0	EMR REC CHECK	EMERGENCY REV. WIRING CHECK : ON OR OFF	OFF
REGEN SPEED	Min. speed for regen braking, as % of vehicle speed	25	ANTI-TIEDOWN	ANTI-TIEDOWN: ON OR OFF	OFF
CTRL MODE	CONTROL MODE	1	FAULT CODE	ON OR OFF	ON
THROTTLE TYPE	THROTTLE TYPE	3	PEDAL INTERLOCK	THREADLE, PB-6, CHECK WIRING	OFF
			PRECHARGE	ON OR OFF	ON

#REF: 1244-0510401

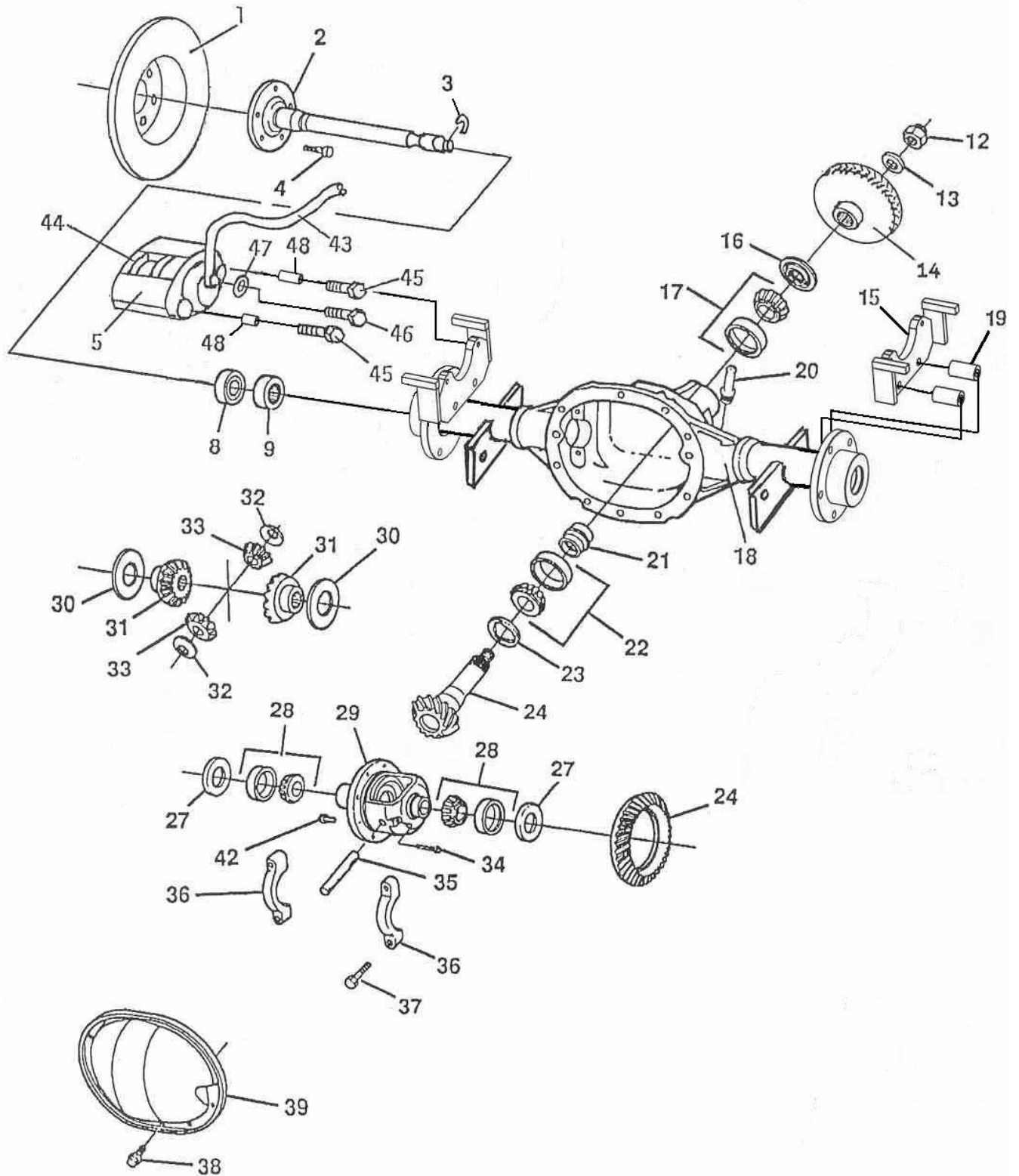
SPARE PARTS

BODY

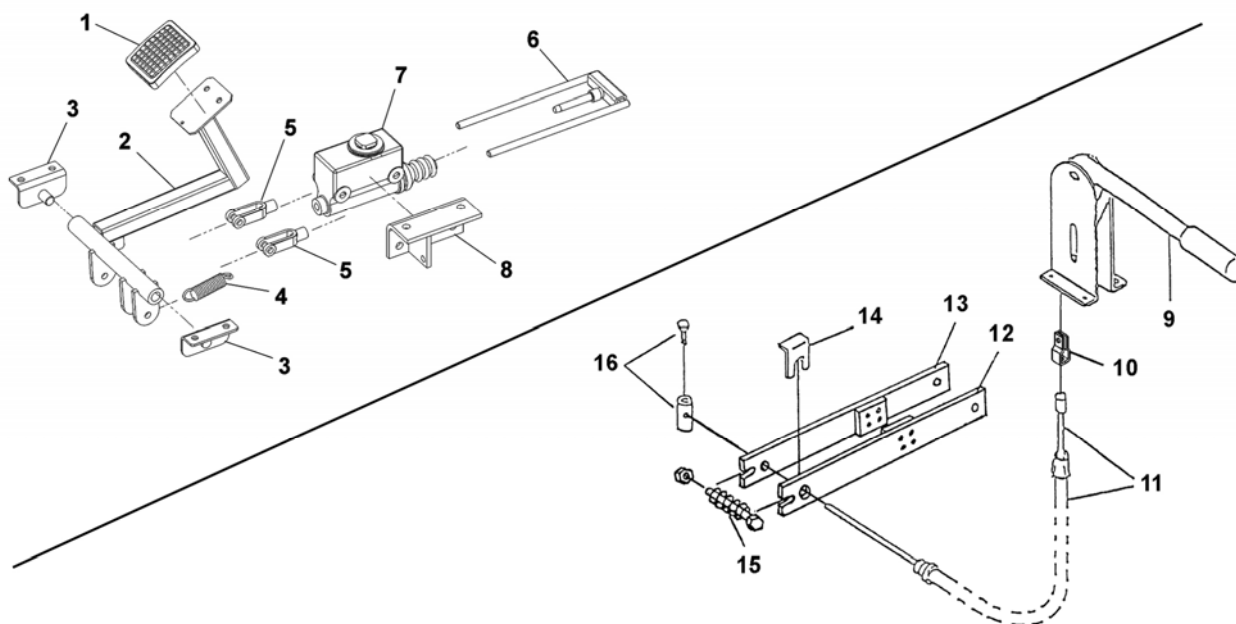


<i>REF.</i>	<i>NUMERO</i>	<i>DESCRIPTION</i>
1	6105236001	BODY
2	2355236001	ROLLER
	2356236001	SHAFT, ROLLER
	2200010	BEARING
3	2311000006	RUBBER BUMPER 16"
4	283001	4.8X8 LRC WHEEL
	2807001	BLACK SOFT RUBBER WHEEL
	2807007	RIB GREY SOFT RUBBER WHEEL
	2450001	STATIC STRAP
5	900-2595	FLOOR MAT, ADHESIVE
6	2200018	PIN, ROLL-OUT
	2662002	SPRING, PIN ROLL-OUT
7	2500250002	DASHBOARD
8	2205002	GRAMMER SEAT WITH SWITCH

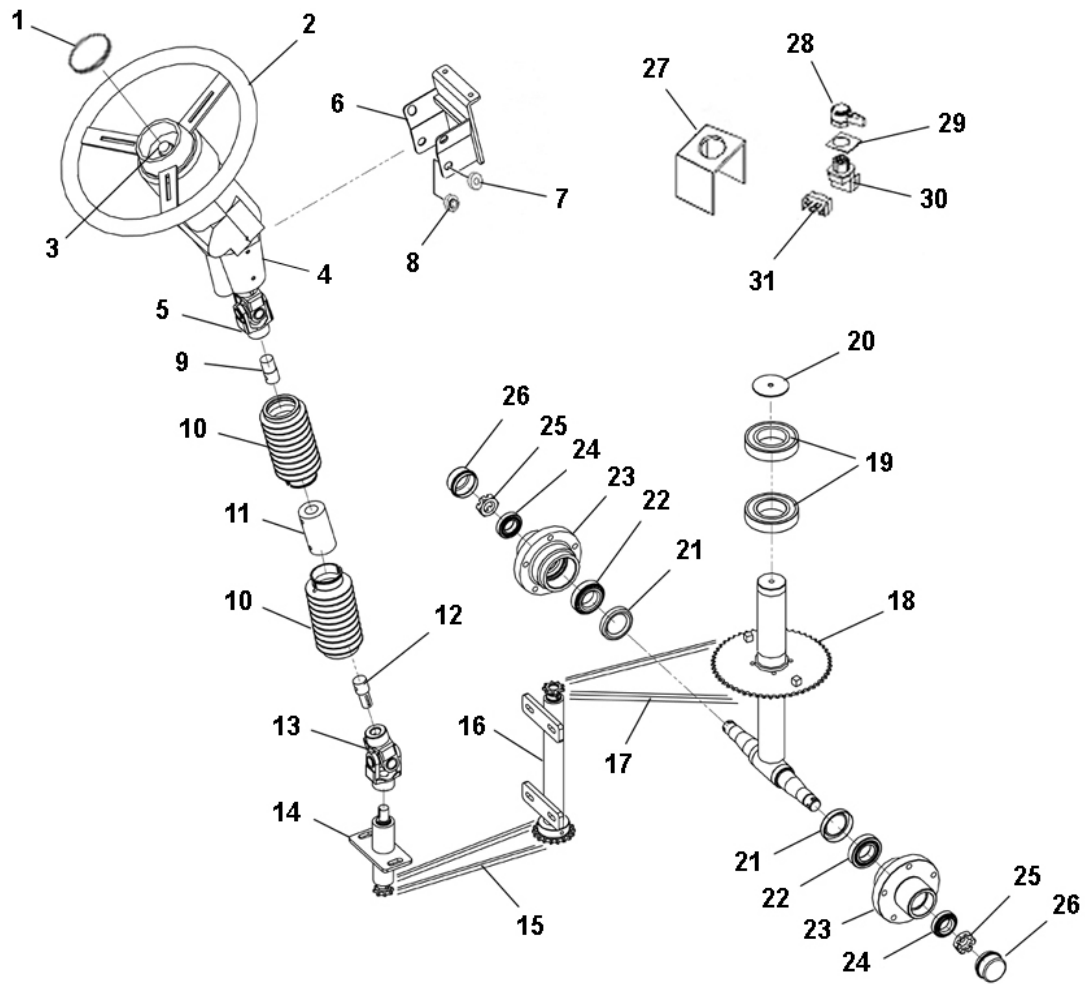
DIFFERENTIAL



REF.	PART NO	DESCRIPTION
1	481433	DISC (HYDRAULIC BRAKE)
2	2173236001	REAR AXLE
3	242053	LOCK
4	242054	WHEEL STUD
5	481430K	LEFT CALIPER
	481431K	RIGHT CALIPER
	481430RK	REPAIRE KIT, CALIPER
8	2420011	OIL SEAL
9	2420010	NEEDLE BEARING
12	242058	NUT
13	242059	FLAT WASHER
14	2113000002	PULLEY W90
15	2122236001	MOUNTING PLATE (CALIPER)
16	242060	OIL SEAL
17	242061	TAPERED BEARING
18	2235008	HOUSING
19	2320006	SPACER
20	242063	BREATHER
21	242064	SPACER
22	242065	TAPERED BEARING
23	242066	SHIM
24	242067	GEAR KIT
27	242069	SHIM
28	242070	TAPERED BEARING
29	242071	CASE
30	242072	WASHER
31	242073	GEAR KIT
32	242074	WASHER
33	3620027	GEAR KIT
34	242076	SCREW
35	3620006	SHAFT
36	242078	CAP
37		BOLT
38	242079	DRAIN PLUG
39	242080	DIFFERENTIAL COVER
42	2420019	BOLT
43	481432	BRAKE HOSE FOR DISC BRAKE
44	2814003	BRAKE PADS
45	481434	BOLT, LONG
	481442	BOLT, SHORT
46	481440	HYDRAULIC BOLT
47	481441	WASHER
48	3614002	BUSHING, LONG
	3614003	BUSHING, SHORT

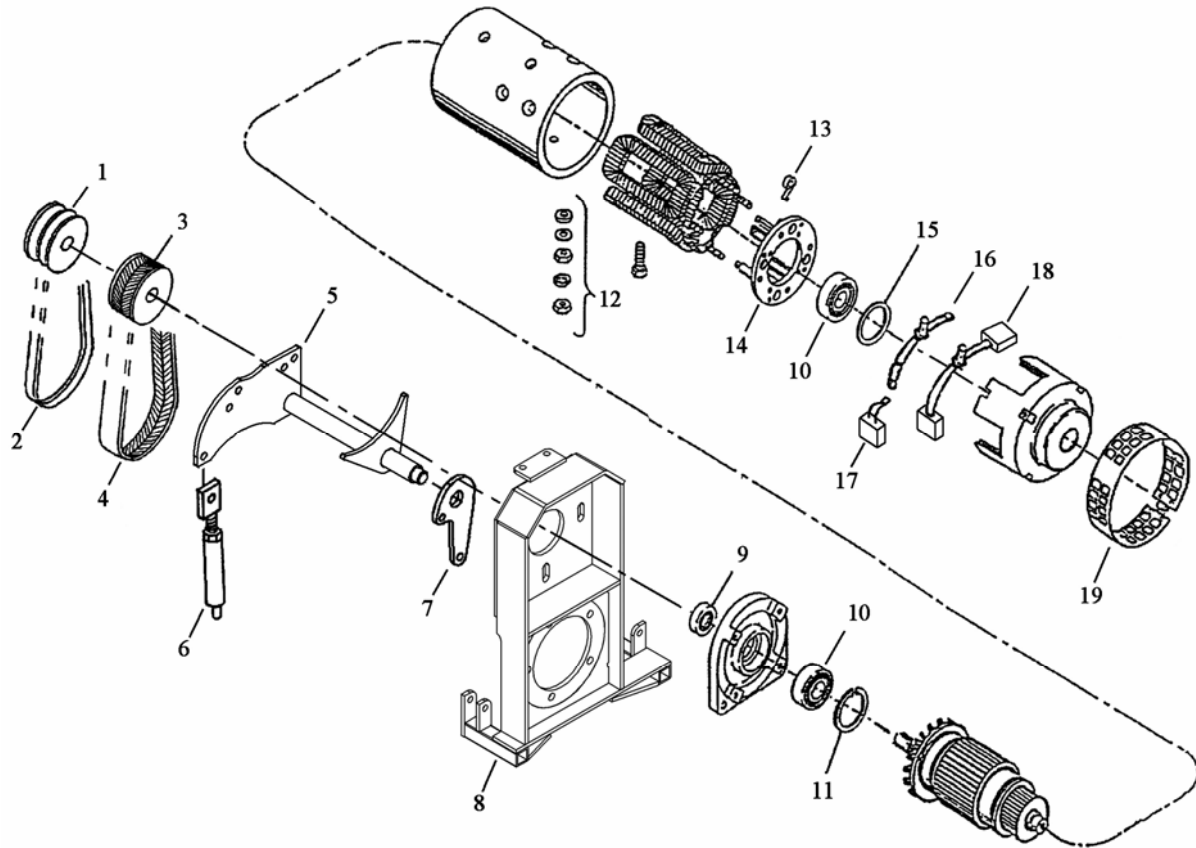
BRAKE CONTRÔLS

<i>RÉF.</i>	<i>PARTS NO.</i>	<i>DESCRIPTION</i>	<i>QTY.</i>	<i>RÉF.</i>	<i>PARTS NO.</i>	<i>DESCRIPTION</i>	<i>QTY.</i>
1	242801	RUBBER	1	9	3616013	HANDBRAKE	1
2	2131248001	BRAKE LEVER	1	10	2416009	YOKE	1
3	2132248002	PIVOT	2	11	362831A	CABLE	1
4	2190000003	SPRING	1	12	2316005	HANDBRAKE PAD	1
5	122813	YOKE 3/8	2	13	3616014	HANDBRAKEPAD	1
6	2133300001	ROD	1	14	362832	CLIP	1
7	2125000001	MASTER CYLINDER	1	15	3616015	SPRING	1
8	2135248001	SUPPORT	1	16	362833	CABLE STOPPER	1

STEERING WHEEL

RÉF.	PART NO.	DESCRIPTION
1	2330014	HORN BUTTON
2	2330013	STEERING WHEEL
3	2230014-HBK	HORN BRUSH KIT
4	2200224004	TILT/TEL COLUMN
5	2330015	UNIVERSAL JOINT
6	2230015	SUPPORT
7	2230016	WASHER
8	2230017	BUSHING
9	2200224003	SHAFT
10	2809000001	RUBBER BOOTS
11	2200248002	NYLON COUPLER
12	2200224002	SHAFT
13	231404	UNIVERSAL JOINT
14	2330012	PIVOT
15	2110248001	CHAIN 46"
16	2205248001	FRONT PIVOT

RÉF.	PART NO.	DESCRIPTION
17	2110248002	CHAIN 40 1/2"
18	2203248001	FORK
19	2102124001	BEARING
20	201434	WASHER
21	2229300002	OIL SEAL
22	2103300003	BEARING
23	2224300002	HUB
24	2103300005	BEARING
25	2910300002	JAM NUT 1 1/4 - NF
26	2229300001	DUST CAP
27	2230023	CASE F/R
28	366221	GREY HANDLE
29	2361001	NAMEPLATE F/R
30	366212	SWITCH
31	800TXA	CONTACT BLOC

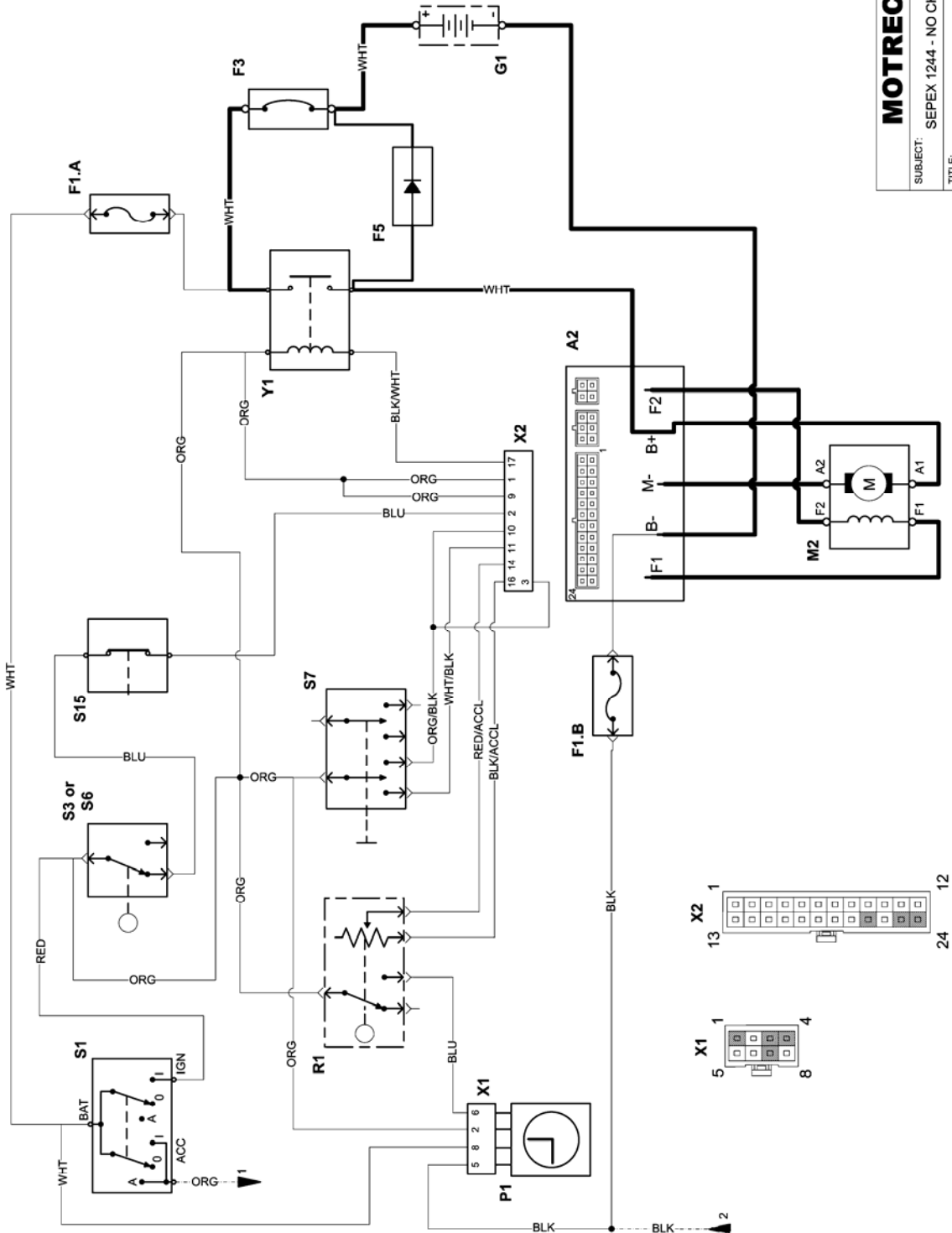
MOTOR AND DRIVE**COMMON PARTS**

REF	DESCRIPTION	PART #	REF	DESCRIPTION	PART #
1	PULLEY	262424	8	MOTOR BASE, FORD	Contact manuf.
2	V BELT	242431		BELT TENSIONER	2152002
3	PULLEY	3651001	9	SEAL	484001
4	BELT, EAGLE	3651002	10	BEARING	484003
5	MOTOR BASE, GM	Contact manuf.	11	SNAP RING	484004
6	BELT TENSIONER, LONG	2452005	12	NUT WASHER PACK	484006
7	BELT TENSIONER, SHORT	2452003	15	WAVY WASHER	484013
	PIVOT	2452002	19	HEADBAND	484015
				EE HEADBAND KIT	A91-107A

SPECIFIC

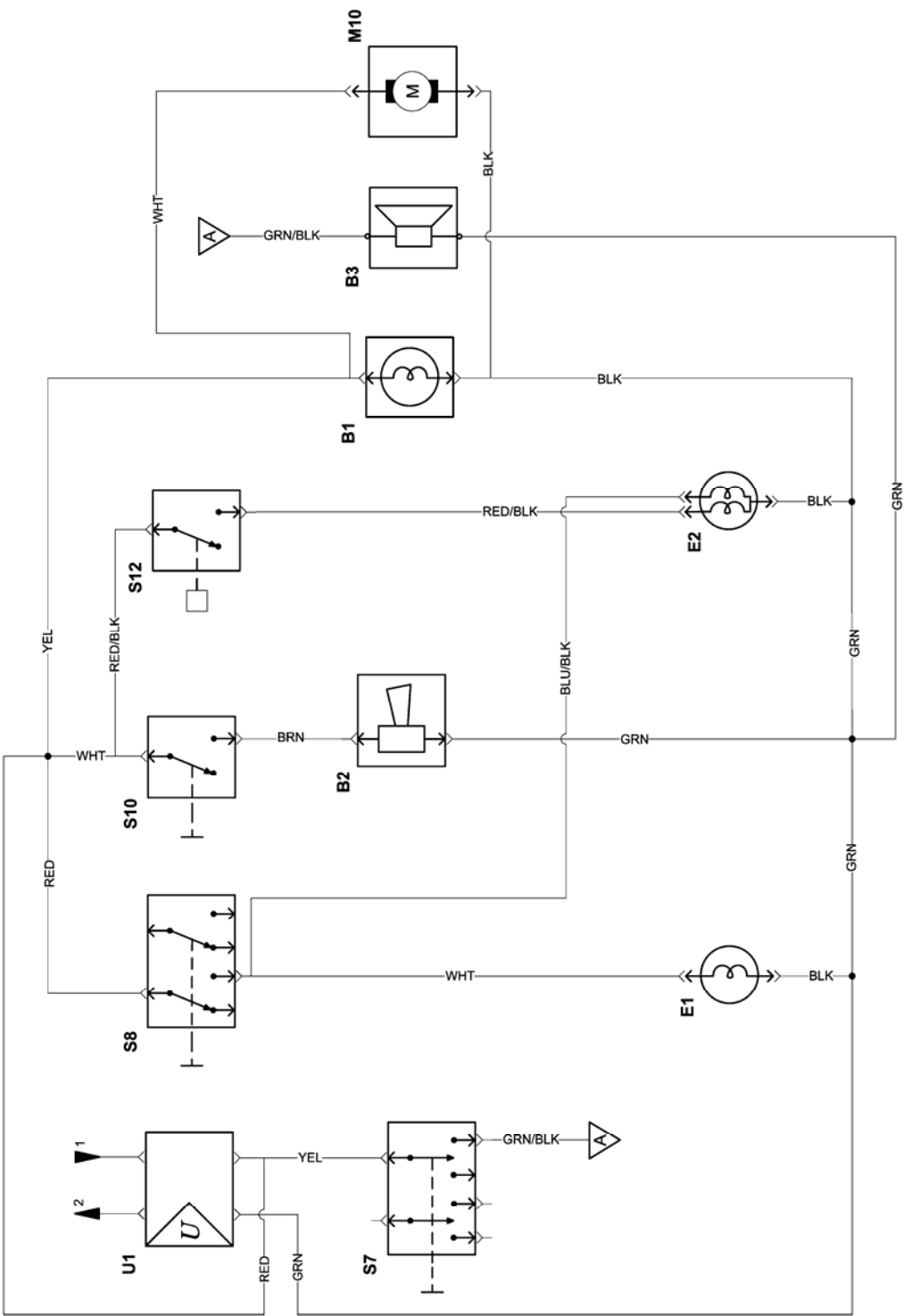
REF	DESCRIPTION	A89	B98	A00	D00 SEPEX	DC3 SEPEX	DANA DRIVE
	MOTOR ASS'Y	484000	204050	2950002	2450003	3112210001	3122230001
13	BRUSH SPRING	484010	484010	2450006	2450006	2450006	2450006
14	BRUSH PLATE	484011	484011	2450007	2450007	2450007	2450007
16	LEAD ASSY.	484017	484017	N/A	N/A	N/A	N/A
17	BRUSH	484009	484009	N/A	N/A	N/A	N/A
18	LEAD AND BRUSH ASSY.	N/A	N/A	2450008	2450008	3112210004	2450008

ELECTRICAL DIAGRAM – SEPEX MAIN CIRCUIT **DIAGRAMME ÉLECTRIQUE – CIRCUIT PRINCIPAL SEPEX**



MOTREC INC.			
SUBJECT:	SEPEX 1244 - NO CHARGER		
TITLE:	MAIN CIRCUIT-SEPEX		
VERSION:	01	DATE:	2005-10-26
AUTHOR:	J. GAGNON	APPROVED:	
DRAWING #:	SEPEX 1244 - NO CHARGER.VSD		

ACCESSORIES – DC/DC CONVERTER
ACCESSOIRES – CONVERTISSEUR DC/DC



MOTREC INC.			
SUBJECT:	ACC - 1HL1TL1SL1CF		
TITLE:	ACCESSORIES - DC/DC CONVERTER		
VERSION:	01	DATE:	2006-04-11
AUTHOR:	J. GAGNON	APPROVED:	
DRAWING #:	ACC - DC-DC - 1HL1TL1SL1CF VSD		

PARTS LIST

NO	DESIGNATION	REF	QTY
A2	SEPEX SPEED CONTROL	1244-4451	1
B1	STROBELIGHT	*	1
B2	HORN	*	1
B3	REVERSE ALARM	*	1
E1	HEADLIGHT	*	1
F1.A,B	FUSE, 15A	246108K	2
F3	CIRCUIT BREAKER, 150A	3107000002	1
F5	DIODE BRIDGE	3669027	1
G1	BATTERY		
M2	SEPEX MOTOR		1
M10	COOLING FAN – 12V	3129224001	1
P1	HOUR METER, BATTERY GAUGE	*	1
R1	ACCELERATOR CURTIS	3062001C	1
	POTENTIOMETER	367008	1
	SPRING	2262004C	1
	MICRO-SWITCH	2262001C	1
	LEVER	2262003C	1
S1	KEY SWITCH	246205	1
S3	SEAT SWITCH, MICRO-SWITCH	3109100002	1
	SEAT SWITCH, SEAT MOUNTED	366216	1
S7	F/R SELECTOR - TILT/TEL COLUMN	366212	1
S8	LIGHT SWITCH, ROCKER TYPE	1269004	1
S10	HORN BUTTON, TILT/TEL COLUMN	*	1
S12	HYDRAULIC BRAKE LIGHT SWITCH	3669004	
S15	EMERGENCY PUSH BUTTON	3109800001	
	EMERGENCY PUSH BUTTON, LABEL	3109800006	
U1	DC-DC CONVERTER	*	1
X1	HOUR METER CONNECTOR		1
X2	SPEED CONTROL CONNECTOR		1
Y1	MAIN CONTACTOR	246112	1
	HEAVY DUTY MAIN CONTACTOR	GE800AH205X0	1
	STATIC STRAP	2450001	1

* Consult Motrec illustrated parts

MOTREC ILLUSTRATED ACCESSORIES

 <p>Strobelight, polemount Amber 12-80V: 3116000001 Red 12-80V: 2469001 Blue 12-80V: 3690008</p>	 <p>Red Tail/Brake light Housing: 3069012R Bulb 12V: 3117240001</p>	 <p>Headlight Left: 3111480003 Right: 3111480004 Bulb H/L: 3117480001 Bulb Turn: 3117480003 Bulb Mark: 3117480002</p>	 <p>Horn button VIP 2330014</p>
 <p>Strobelight, cab mount Amber 12-48V: 3116250001 Red 12-48V: 3069026 Blue 12-48V: 3069014 Amber 72-80V: 3116720001 Red 72-80V: 3116720002 Blue 72-80V: 3116720003</p>	 <p>Back-up lamp Grommet: 3269001 12V: 3669012 24V: 3669012A</p>	 <p>Turn signal switch 246050</p>	 <p>Horn button, column mount 246210</p>
 <p>Amber turn lamp 12V: 3069020 Bulb 12V: 3069021</p>	 <p>Clear lamp 12V: 3069012 Bulb 12V: 1269008</p>	 <p>Analog Voltmeter 12V : 3069007 24V : 2469002 36-48V : 3669002</p>	 <p>Horn button, dash mount 266210</p>
 <p>Red Tail/Brake light Grommet: 3269001 Plug: 246012A 12V : 2469021 24V : 2469022</p>	 <p>Pedestral head lamp 12V: 2569001 Bulb 12V: 2569001B Bulb 24V: 4469001</p>	 <p>HOBBS Gauge 24V: 2469026 36V: 3069038 48V: 4869037</p>	 <p>Horn button 3109250001</p>
 <p>Red Tail/Brake light 12V: 386002</p>	 <p>Headlight Left: 3111480003 Right: 3111480004 Bulb H/L: 3111480006 Bulb Turn: 3111480008 Bulb Mark: 3111480007</p>	 <p>Horn 12V: 246003 24V: 246013</p>	 <p>Limit switch 3030015</p>  <p>Back-up alarm 12-48V : 3100000001 72-80V : 3105720001</p>

<div data-bbox="245 237 440 390"></div> <div data-bbox="177 392 493 453"> DC-DC converter, 10A 12-48V: 3069019 </div> <hr/> <div data-bbox="245 485 440 611"></div> <div data-bbox="177 609 493 699"> DC-DC Converter, 25A 12-48V: 3124000002 72-80V: 3124880001 </div> <hr/> <div data-bbox="245 737 440 842"></div> <div data-bbox="177 852 490 945"> Wiper motor 12V: 3113000001 24V: 486211 </div>	<div data-bbox="586 247 773 321"></div> <div data-bbox="516 354 828 390"> Wiper arm 2800000001 </div> <hr/> <div data-bbox="586 470 773 533"></div> <div data-bbox="516 575 831 667"> Wiper blade 14" Blade: 2800000002 18" Blade: 2800000003 </div> <hr/> <div data-bbox="586 751 773 835"></div> <div data-bbox="516 858 829 921"> Pantograph wiper arm 246233A </div> <hr/> <div data-bbox="586 1003 773 1066"></div> <div data-bbox="516 1098 829 1159"> Pantograph wiper blade 246233 </div>	<div data-bbox="927 237 1105 369"></div> <div data-bbox="854 373 1169 495"> Cab heater 12V: 3103300001 36V: 3669008 48V: 4869020 </div> <hr/> <div data-bbox="927 558 1105 674"></div> <div data-bbox="854 697 1169 730"> 12V Dome light 3669006 </div> <hr/> <div data-bbox="943 764 1097 968"></div> <div data-bbox="854 970 1169 1001"> 12V Fan 3669013 </div>	<div data-bbox="1276 243 1438 422"></div> <div data-bbox="1190 426 1507 459"> Headlamp 12V:3111250002 </div> <hr/> <div data-bbox="1260 491 1438 684"></div> <div data-bbox="1190 686 1507 777"> Headlamp 12V: 3111300001 Bulb 12V: 3111300002 </div> <hr/> <div data-bbox="1260 831 1422 915"></div> <div data-bbox="1190 936 1507 1026"> Red Pilot light 12V: 246212 Bulb 12V: 246212B </div>
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CONVERTER INSTALLATION

Installation and Trouble Shooting Guide SY1200-25

The SY1200-25 is a state of the art DC-DC converter. There are many new features, and special care is required to install this unit properly. If you have problems with the operation of this unit please check the installation procedures for help.

The ORANGE wire is the INPUT POSITIVE>

The BLACK wire near the orange wire is the INPUT NEGATIVE>

The RED wire is the OUTPUT POSITIVE.

The BLACK wire near the red wire is the OUTPUT NEGATIVE.

NOTE: Use the correct black wire for input and output. Do not connect the black wires together. (The black wires are common however, due to the high currents developed in this unit it is necessary to maintain proper electron flow to reduce noise.)

The converter must be mounted on a metal surface for proper heat dissipation. A vertical mounting position is best to maximize the convection process. The unit will shut down thermally under high currents if not properly mounted.

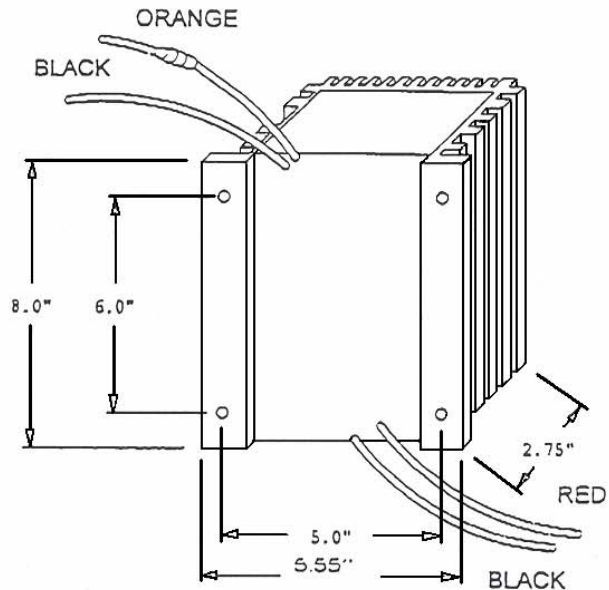
This unit is equipped with digital logic capabilities. The input voltage is monitored to determine acceptability. If the input voltage is below the MIN or above the MAX limits the SY1200-25 will NOT turn on.

The fuse in this unit has no determining factors as to the current carrying capabilities of the converter. The fuse serves only one purpose, and that is to remove the unit from your power source in the event of a failure. The SY1200-25 has a very advanced control section, and will determine when to open the fuse. An open fuse will mean, that a problem had occurred, that does not mean that the problem still exists, or that the problem has gone away.

<<DO NOT increase or by'pass the fuse. USE ONLY A FUSE RATED AT 250V 20A>>

Potential reasons for an open fuse are as follows: (1) The output voltage rises above 18 VDC. This problem can occur when an inductive load is removed or applied at high currents. This is a noise spike and the converter will shut down if it can not suppress the spike. (2) Reverse polarity on the input or output. (3) A chaos condition where the output becomes unstable. (4) Excessive noise or spikes on the input.

Mount this unit as close to the highest current load as possible. (This unit uses true switching techniques to step down the input voltages. The higher the input voltage the lower the input current for a 25 AMP load. The high currents are on the output of the converter.) Use 14 gauge wire for the input up to 5 feet. Use 12 gauge wire for up to 10 feet. Increase the wire gauge for each additional 5 feet of wire. NEVER use less than a 10 gauge wire on the output. If the wire length exceeds 5 feet use 8 gauge wire. IMPORTANT: Use a crimp type of connector to attach the wire to the converter. DO NOT twist the wires together. A poor connection will not only allow the converter to operate poorly, but at 25 amps the connection WILL GET HOT AND BURN IN TWO.



WARNING: THE CHASSIS IS ISOLATED FOR HIGH VOLTAGE APPLICATIONS.
DO NOT USE THE CHASSIS FOR GROUND.

BATTERY DISCHARGE INDICATOR (HOBBS)

This indicator monitors :

- the residual capacity of batteries;
- operating hours;
- status of service down counter.

The residual capacity of the battery is monitored via an 8-LED bar display. When the left red LED lights, the batteries must be charged to avoid damage. The LED display starts flashing as a pre-warning signal. The lower voltage limit is adjustable via potentiometer “M” on the rear.

A	B	C	D	E	F	G	H	I	J	K
1,57	1,63	1,68	1,73	1,78	1,82	1,84	1,86	1,89	1,91	1,93

In order to activate a new adjustment, the unit has to be reset :

- 2.35V/cell reset voltage with battery remaining in vehicle;
- 2,09V/cell reset voltage after battery has been disconnected.

To maintain a good battery performance, it is recommended to limit the discharging to 80% of the battery capacity. The recommended setting for 6V batteries is F and the recommended setting for an industrial battery is K.

An internal relay can prevent overdischarging and damaging the batteries. The relay can be wired to cut off the reverse direction, or energize an N.C. relay and alarm.

Turning off and on the vehicle will override the protection for 30 sec.

The current status (remaining operating hours before maintenance) of the service down counter is indicated for a period of 5 seconds after the key switch is turned on. When it is down to 0, the display flashes. After the maintenance, reset the counter: depress the button “R” on the rear. The service counter is factory programmable only.

24V UNIT #: 2469026

36V UNIT #: 3069038

48V UNIT #: 4869037

2- Orange, key switch

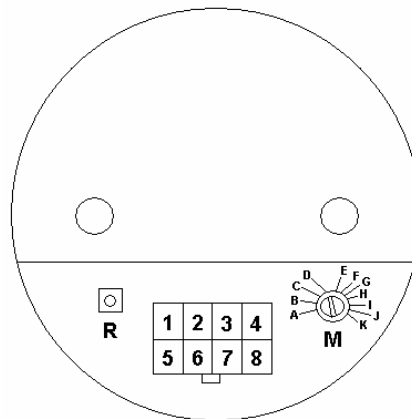
3- Relay +

4- Relay -

5- Black, battery –

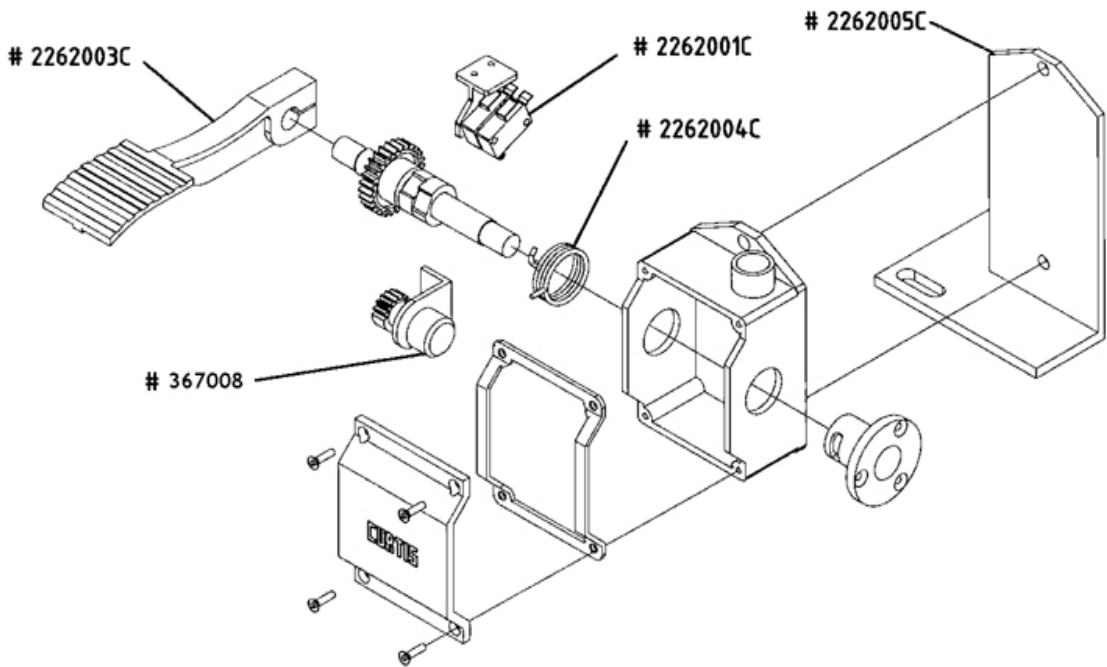
6- Blue, hour counter

8- White, battery +



ADDENDUM

CURTIS FOOT PEDAL



<i>PART. NO</i>	<i>DESCRIPTION</i>
3062001C	ACCELERATOR CURTIS
367008	POTENTIOMETER
2262004C	SPRING
2262001C	MICRO-SWITCH
2262003C	LEVER
3662002	CABLE PROTECTOR

RESP : CLAUDE L	MODEL(E) : T-224/236/248
NO : 235A224001	SER : TO/À :